bart
impact
program

IMPACTS OF BART ON VISUAL QUALITY
INTERIM SERVICE FINDINGS

The BART Impact Program is a comprehensive, policy-oriented study and evaluation of the impacts of the San Francisco Bay Area's new rapid transit system (BART).

The program is being conducted by the Metropolitan Transportation Commission, a nine-county regional agency established by state law in 1970.

The program is financed by the U.S. Department of Transportation, the U.S. Department of Housing and Urban Development, and the California Department of Transportation. Management of the Federally-funded portion of the program is vested in the U.S. Department of Transportation.

The BART Impact Program covers the entire range of potential rapid transit impacts, including impacts on traffic flow, travel behavior, land use and urban development, the environment, the regional economy, social institutions and life styles, and public policy. The incidence of these impacts on population groups, local areas, and economic sectors will be measured and analyzed. The benefits of BART, and their distribution, will be weighed against the negative impacts and costs of the system in an objective evaluation of the contribution that the rapid transit investment makes toward meeting the needs and objectives of this metropolitan area and all of its people.

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BART IMPACT PROGRAM

IMPACTS OF BART ON VISUAL QUALITY
INTERIM SERVICE FINDINGS

MARCH 1976

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U. S. DEPARTMENT OF TRANSPORTATION

AND
U. S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

NOTICE

PREPARED BY
GRUEN ASSOCIATES, INC.

UNDER CONTRACT WITH THE
METROPOLITAN TRANSPORTATION COMMISSION

FOR THE
U. S. DEPARTMENT OF TRANSPORTATION

AND THE
U. S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

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The Phase I visual quality assessment evaluated the effects of BART on the adjacent visual environment in terms of appearance, illumination, and shadows. Both the regional and local visual impacts of BART on the Bay Area were assessed. The *regional scale* assessment identified and evaluated the repetitive visual elements of BART which could be perceived at the regional level and some of the urban form implications of the BART system on the Bay Area. The *local scale* assessment examined the impacts of transit facility improvements which have taken place in the visual environment immediately adjacent to the BART right-of-way. The purpose of the *nighttime illumination* study was to determine what effect direct visible light sources, such as train lights, station lighting and parking lot illumination, have on nighttime visual environments. The *shadow* study evaluated the effects of shadowing on areas adjacent to elevated and at-grade guideways and stations.

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PREFACE

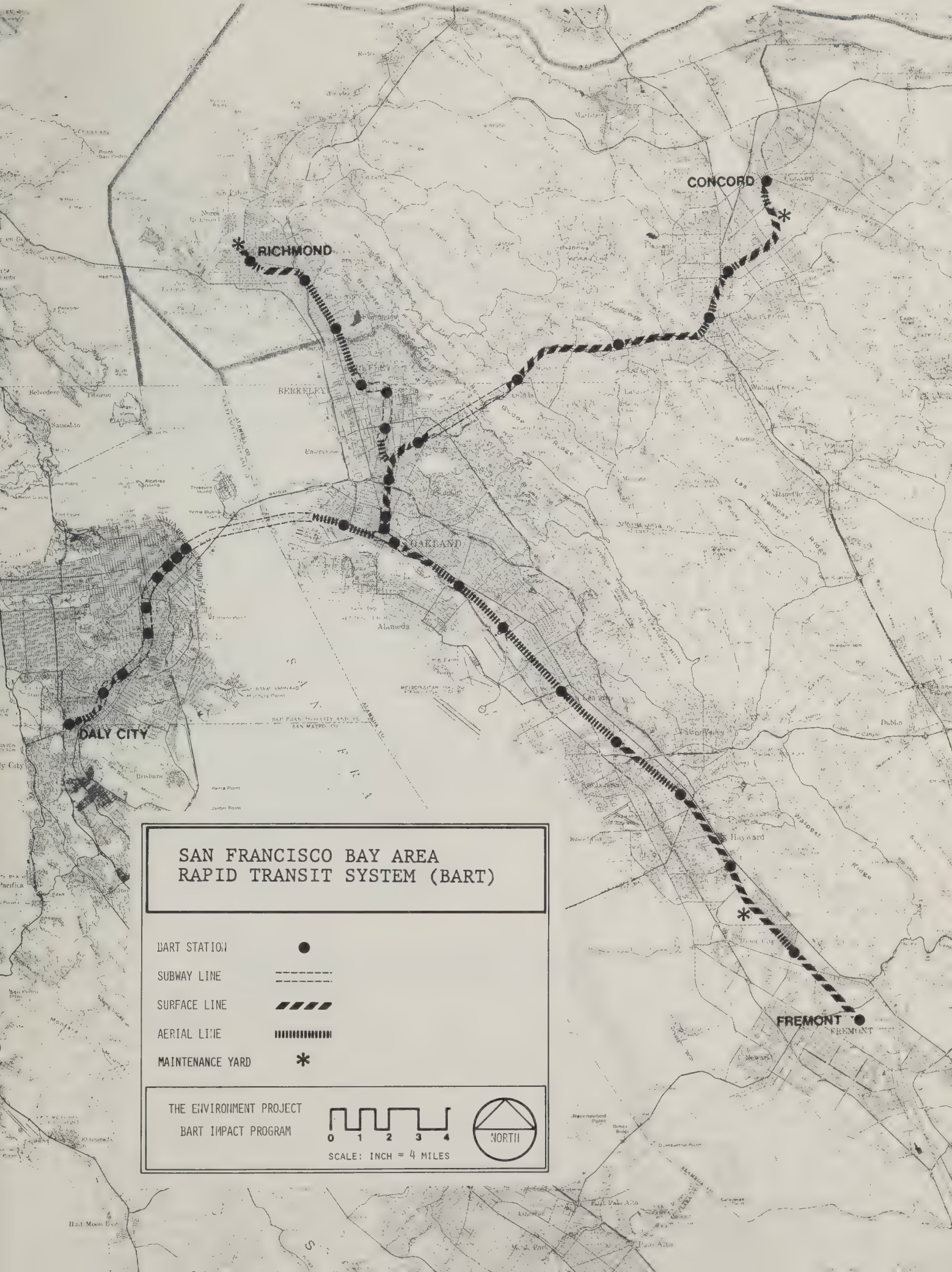
The BART Impact Program (BIP) is a comprehensive, policy-oriented study and evaluation of the impacts of the new San Francisco Bay Area Rapid Transit System (BART). The system's alignment and configuration are shown on the page following this preface. The BART Impact Program covers the entire range of potential rapid transit impacts, with major projects covering impacts on traffic flow, travel behavior, land use and urban development, economics and finance, social institutions and life styles, public policy and the environment. The incidence of these impacts on population groups, local areas, and economic sectors is being measured and analyzed. The benefits of BART, and their distribution, are being weighed against the negative impacts and costs of the system in an objective evaluation of the contribution that the rapid transit investment makes toward meeting the needs and objectives of the Bay Area and all of its people.

The Environment Project focuses on the effects of BART's physical presence on its surroundings. Environment is defined broadly to include five components: acoustic, atmospheric, natural, social and visual. Within each of these components the Environment Project will address two related phenomena:

- Direct and indirect physical effects upon the environment brought about by the BART system.

- Social and psychological consequences of these physical changes to the environment.

This report, Impacts of BART on Visual Quality, includes an assessment of effects on appearance, illumination and shadows. It is a technical paper containing a detailed presentation of visual findings and the study methodology employed. This report is an interim document as study of BART's visual impacts is continuing. Phase I, covered in this report, concentrated on BART's visual effects on the physical dimensions of the Bay Area. However, measurements and assessment were made under interim BART operations. In Phase II, additional assessment will be made as operational conditions change. Also in Phase II, people who live and work next to the BART system will be studied as to how they perceive and respond to impacts. And finally, in Phase II a comparison of BART's impacts with those of other means of providing a similar level of public transportation service will be made. The findings as derived here formed part of the basis for the development of Phase I conclusions regarding BART's overall environmental impacts. These interpretations are reported in the Phase I report, Environmental Impacts of BART: Interim Service Findings.


CONCORD
RICHMOND
BERKELEY
OAKLAND
Alameda
DALY CITY
Hayward
FREMONT
SAN FRANCISCO BAY AREA
RAPID TRANSIT SYSTEM (BART)
BART STATION
SUBWAY LINE
SURFACE LINE
AERIAL LINE
MAINTENANCE YARD
THE ENVIRONMENT PROJECT
BART IMPACT PROGRAM
0 1 2 3 4
SCALE: INCH = 4 MILES
NORTH

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INTRODUCTION

The purpose of the Phase I's visual quality assessment was to evaluate the effects of BART on the adjacent visual environment in terms of appearance, illumination and shadows. As with other studies within the Environment Project, the assessment focused on BART's impacts on its surroundings. This assessment deferred to Phase II of the Environment Project any evaluation of changes in visual quality as perceived by the rider in either train or station environments. During Phase II, effects of BART-related induced development on the visual environment will also be evaluated.

The Phase I assessment examined both the regional and local visual impacts of BART on the Bay Area. The regional scale assessment defined and evaluated the repetitive visual elements of BART which could be perceived at the regional level and some of the urban form implications of the BART system on the Bay Area. The local scale assessment examined the impacts of transit facility improvements which have taken place in the visual environment immediately adjacent to the BART right-of-way. The purpose of the nighttime illumination study was to determine to what degree direct visible light sources, such as train lights, station lighting and parking lot illumination are disruptive to nighttime visual environments. The shadow study evaluated the effects of shadowing on areas adjacent to elevated and at-grade guideways and stations.

REGIONAL VISUAL EFFECTS

The San Francisco Bay Area consists of a unique visual composition of urbanized areas shaped by the ocean, the Bay, and land forms. Urbanization has occurred within these physical parameters and has responded to them with bridges, distinctive downtown areas and activity centers, and relatively contained linear corridors of urban development.

While considerable low-density peripheral growth has occurred in recent years, this growth has been concentrated around satellite core areas and in established development corridors, leaving substantial areas of natural vegetation and open space, as well as the Bay separating and defining areas of development. In some areas, regional shopping centers have refocused commercial activity and added a new element to the regional urban form.

Methodology

The regional findings are primarily the result of extensive familiarity with the interaction between the BART system and major form-giving elements in the Bay Area. The findings are based on observations made from aerial reconnaissance and photography, ground reconnaissance from areas surrounding the system, and from reconnaissance aboard the trains and in the station areas. The impressions gained from these various perspectives merged into concepts or findings relative to visual relationships between BART and the region.

It should be noted that analysis of "urban form" can be very broad and elusive. For our purposes, the study concentrated on just two aspects: patterns of urbanization and visual image. The former is obviously more than just a visual phenomenon, as it encompasses physical, social, economic and political components. However, the visual aspects of urbanization patterns or urban form play an important role in its conceptualization and therefore should not be overlooked. BART's regional visual image is an effect of the system's repetitive and highly visible surface and aerial guideways, stations and informational and directional signs. Taken together, they create a distinct new visual element and hence were included in the study.

Issues and Findings

What effects has BART had on the regional pattern of urbanization in the Bay Area?

BART has generally enhanced regional urbanization characteristics by reinforcing existing development patterns and major transportation corridors, and by not visually affecting major natural amenities. The location of primary BART destination stations in all eight of the major downtown areas in the three counties served by BART, combined with the development of plazas, pedestrian areas and refurbished urban streets, strengthened these areas. Transit service is also provided to 13 local activity centers and 3 regional commercial centers (Table 1). The physical and visual presence of BART in these areas contribute to a sense of regional cohesiveness resulting from the linking of centers by a common transportation system.

Table 1
URBANIZED AREAS SERVED BY BART

Central City Areas	Activity Centers	Regional Shopping Centers
San Francisco	Orinda	El Cerrito Plaza
Oakland	Lafayette	Bayfair
Berkeley	College Avenue	Fremont
Concord	Glen Park	
Richmond	Mission Street	
Hayward	Union City	
San Leandro	Daly City	
Walnut Creek	Fruitvale	
	Alameda County Coliseum Complex	
	Ashby-Adeline	
	Pleasant Hill	
	Oakland Museum-Laney College	
	San Francisco Civic Center	

Over 15 miles of freeways, the visually dominant existing regional transportation element, have been visually reinforced by locating stations and guideways in median and parallel alignments. An additional 20 miles of BART alignment are located alongside existing railroad tracks, and approximately 8 miles of the BART system utilize arterial rights-of-way.

The primary open space areas and San Francisco Bay have not been significantly visually changed by the BART system. The dominant visual urban form elements in the three counties in which BART is located and, to a large extent, in the entire Bay Area are the hills and the Bay. These have been left visually unaffected by BART. BART crosses beneath the Bay in the Transbay Tube and in tunnel configuration through the Berkeley Hills, which have no visual impacts on the existing environment. All aerial and at-grade guideway segments (approximately 51 miles) are located in the flatlands below the hills in urban or semi-urbanized areas.

It was hypothesized that the general understanding and perception of the physical characteristics of the Bay Area have been improved for the users of BART. By locating guideways along primary transportation rights-of-way and stations in or adjacent to activity centers, BART riders have been more exposed to the basic urban structure of the Bay Area than prior to the existence of BART. While this hypothesis has not been validated in Phase I, surveys scheduled for Phase II will attempt to determine whether or not perception of the Bay Area has changed as a result of BART.

What elements of BART are present in the visual environment at a regional scale?

Elevated stations are the most numerous station type (20 of 34 stations) and are highly visible from adjacent developed areas. They are generally visually distinct from one another throughout the system, yet are easily recognizable as part of the total BART system. Underlying functional requirements, such as platform length, height, use of building materials and often the presence of parking facilities, create a repeated visual image. Aerial guideway structures, when located along arterial rights-of-way or in the median, constitute distinctive urban forms and are highly visible and uniformly recognizable elements of the BART system (pp.6-8).

The trains are highly visible and immediately identifiable as part of the BART system. They are visually unique as a transportation mode, uniform in appearance, are in motion and are seen in all above-grade areas of the system.

BART directional signs guiding motorists toward stations are distinctive, uniform and frequent. They expand the visual image of BART beyond immediate station areas and visible system facilities. The extent to which this is actually noticed by Bay Area residents will be investigated in Phase II's interview studies.

LOCAL VISUAL EFFECTS

The assessment of localized visual effects of BART examined BART-related impacts which have taken place in the visual environment adjacent to guideways and stations. Changes in the local visual environment have been caused by the introduction of both static and dynamic BART elements. These include: guideways, trains, stations, parking facilities, landscaping, lighting, and pedestrian and vehicular areas.

Methodology

In contrast to the regional assessment, local visual effects were evaluated in a highly structured manner. First, based on observation of land use, degree of formality of buildings and open spaces, and density, size and scale of structures, all areas along BART's 71 miles were categorized into local visual settings. Six types of settings were identified (pp.39-40):

- Central downtown areas — 3 miles
- Small downtown and commercial sub-center areas — 5 miles
- Urban residential areas — 18 miles

• Suburban residential areas	19 miles
• Industrial/commercial area	11 miles
• Areas of open land and water	15 miles
	71 miles

Nearly 50 study sites were selected based on their representing all of the identified local settings and various combinations of BART facilities (p. 41). While the evaluation was site-specific, the representativeness of the settings permitted systemwide assessment. Each study site was evaluated to determine the degree of BART's visual prominence and whether it reinforced or detracted from the local setting. The evaluation was made by comparing what the visual environment of the local setting would be without BART and what BART-related changes were introduced. Basic form elements such as size, shape, mass, openness, linearity, height and movement were compared for contrast and compatibility. The final step in the evaluation was to look at the appropriateness of the BART-related changes. Evaluation of appropriateness was based on urban design criteria, largely adapted from those used in the San Francisco Urban Design plan (pp. 37-38).[1]

The local visual evaluation and the subsequent findings tended to cluster around four central issues:

- Change in visual scale.
- Change in architectural character.
- Change in visual focus.
- Change in street, pedestrian, and open space areas.

Issues and Findings

What visual scale changes have occurred as a result of the introduction of BART into existing urbanized areas?

The introduction of transit stations and guideways into existing urbanized areas results in changes in visual scale in some settings. BART structures and related open space areas that are significantly larger or smaller in scale, relative to the adjacent development, have resulted in changes in the visual environment.

[1] San Francisco Department of City Planning (1971), The Comprehensive Plan: Urban Design.

The most prominent contrast in the visual scale of the existing environment has occurred in areas where BART at-grade and aerial stations and guideways have been located immediately adjacent to urban and suburban residential areas. Approximately 32 miles of the system are in this pattern. However, much of that mileage is also alongside or within the median of other transportation facilities, a factor which tends to ameliorate the potential extent of impact. The large scale of the BART stations and guideways generally is not compatible with the typical smaller-scale residential development. The introduction of large, surface parking facilities into residential areas created distinct contrast in scale between the open parking facilities and the more closely spaced residential units.

BART aerial guideways in residential areas, when visually set off by adjacent open spaces of streets and railroad right-of-way, permit easy visual comparison of small-scale houses with BART's larger scale and form. Aerial and surface portions of the system which run through residential areas, but utilize freeway alignments or incorporate linear parks as part of the right-of-way, tend to be more compatible with existing adjacent development. The scale, height and width of the freeway effectively screen the potential visual effects of BART. The linear parkways tend to soften the contrast between the massive BART structures and the smaller surrounding residential structures.

The scale of the structures found in three regional shopping centers (El Cerrito, Bayfair and Fremont) is similar to the scale of the elevated BART station facilities adjacent to the three centers. The strong horizontal lines of the station and guideways are similar to the structural elements of the shopping center complex.

BART aerial guideways, stations and parking lots are generally similar in scale to development in industrial/commercial areas. The large size and scale of industrial/commercial facilities and the pattern of land development in such areas are similar to or larger than the scale and character of BART facilities.

In two cases, the Union City and Coliseum stations, provide a transition in scale from the massive forms of industrial and coliseum structures to smaller-scale adjacent residential development.

In order to accommodate BART guideways and station facilities in the median of Highway 24, it was necessary to widen a portion of the freeway. After widening, the freeway became a dominant form element in contrast to the surrounding natural forms of hills and valleys. Cuts and retaining walls were increased in size due to the widening; however, the BART facilities within the freeway median have had little visual impact in this setting.

How have BART stations and guideways attempted to reflect the architectural character of the adjacent development?

The architectural character of the urbanized areas around much of the BART system was well established. The introduction of guideways, stations and related facilities, which have unique architectural characteristics, reflect the architectural character of the surrounding structures mainly through structural design and the use of linear parks and landscaping.

The design of BART structures, particularly its aerial guideways, shows careful consideration to the problems of imposing a massive structure into residential areas. Attesting to the thoughtful design that went into the BART facilities are the numerous architectural awards the entire system, as well as individual components, has won (pp. 31-32). However, it is one thing to have a well-designed facility and quite another to be able to visually complement radically different adjacent development. About 60% of BART's aerial facilities are in residential areas, often in close juxtaposition with small-scale houses and local residential streets.

The designers responded to the challenge of visually integrating BART in three ways (pp. 27-29):

- Support elements give horizontal scale to the structure. Their spacing and clear architectural expression, through decorative projections beyond the guideway, give the powerful horizontal form of the guideway a rhythm similar in feeling to that of nearby building facades, street trees and street lights.

- The massive appearance of the individual support elements or bents is reduced by careful articulation of their surfaces. Faceting of the columns and the gentle upward slope of the "T" arms permit the entry of light in such a way as to visually minimize massiveness.

- Visual overpowering of other smaller-scale form elements was reduced by separating the guideway structure into two parts, minimizing its cross-sectional bulk and articulating it into several angled surfaces.

Landscaping stands out as perhaps the single most important design element in making BART's structure more compatible with small-scale visual settings. Trees similar in height to that of the aerial structure help screen it from view or help break up its massiveness. The Pleasant Hill station has one of the largest surface parking lots in the BART system (1,400 spaces), yet, by retaining a stand of mature oak trees on the site and adding substantial numbers of new smaller trees, the parking lot was visually broken up into several small spaces, and the station and aerial structure are largely screened from view. The tall trees maintain a visual continuity with other existing trees in the area. In other instances,

landscaping was used to visually integrate stations and related parking facilities into a developed area by continuing existing neighborhood landscaping patterns onto the station site area.

In what ways has BART influenced existing visual foci in areas surrounding BART, and in what ways has BART created its own visual foci?

A BART station, because of the size of the structure and the movement of trains, persons, buses and vehicles around the station, creates a strong visual focus in most settings. This increased activity can reinforce an already existing visual focus in the area or can create a new focus within a developed area. This visual focus effect can significantly alter the visual character of an existing developed or open space area.

By locating BART stations on the edges of established small downtown areas (Walnut Creek, Concord, and Richmond), the visual focus of these areas has been shifted from the main downtown areas to the stations and the station-related parking and pedestrian areas. In Walnut Creek, the BART station created a new area of visual focus four to five blocks north of the existing downtown. This location has caused shifts in both vehicular and pedestrian circulation patterns in the CBD. Shift in visual focus also occurred in some commercial sub-center areas (such as around the 16th and 24th Streets stations in the Mission district of San Francisco), where pedestrian plazas were located somewhat away from the mainstream of existing commercial activity.

At three regional shopping centers (El Cerrito, Bayfair and Fremont) the location of BART stations adjacent to these facilities reinforced the visual focus and visual activity of these centers. The increased activity related to the operation of the transit facilities complements the existing levels of activity in these areas.

Approximately 1.8 miles of the BART line on aerial guideway, which is located in urban residential settings, run in the median of an arterial highway. This median location resulted in a shift of visual focus from the street and pedestrian areas to the guideway structure. This change in focus has tended to emphasize the guideways and trains in the residential settings and de-emphasize the existing street and pedestrian areas as well as the smaller-scale residential structures.

A similar physical situation, but in a different setting, occurred with arterial streets in industrial/commercial areas. In these circumstances, strong and positive visual definition was achieved. In many cases, street facades were broken and visually discontinuous. The aerial guideway structures often effectively screened these broken facades from view and improved street definition. The BART aerial structure along San Leandro Avenue, south of the Coliseum station, is a good example of new, strong street definition BART provided in industrial/commercial areas while screening potentially confusing views from motorists.

BART guideways on embankments in parts of Concord, Hayward and Union City provided visual and physical separation of incompatible land uses by partially screening existing industrial areas from nearby residential areas.

Under what circumstances has BART affected the visual quality of surrounding areas by introducing changes to pedestrian, street or open space areas?

New pedestrian and open space areas in the form of plazas, sidewalks, linear parks and parking facilities were introduced into areas around BART. These new pedestrian elements, combined with increased BART-related pedestrian traffic, caused changes in the visual environment around the system. In addition to new areas, substantial portions of existing streets and pedestrian areas were refurbished. This, too, caused change to the existing visual environment.

In downtown locations in San Francisco, Oakland and Berkeley, the existing urban streets and pedestrian areas were altered as a result of the construction of BART. Following the completion of construction, these areas were rebuilt, often far beyond the pre-BART condition. Changes in the quality of the visual environment resulting from the reconstruction of streets and pedestrian areas were most striking in downtown San Francisco, particularly along Market Street where extensive street and pedestrian area improvements dramatically add to the visual environment of the street. Market Street was graced with new street trees, widened sidewalks with new paving, reproductions of historic street light fixtures and new street furniture, including benches and signs (p. 11). The total cost of these improvements was approximately $34 million. This cost was shared by BART, the City and the local merchants. Similar, though less extensive, improvements were made to Broadway in Oakland and Shattuck Avenue in Berkeley.

In addition to street refurbishment in downtown locations, some urban residential areas where the BART line was constructed in a subway configuration had existing streets and pedestrian areas refurbished following completion of BART construction. For example, in Berkeley, Adeline Street and Shattuck Avenue were rebuilt utilizing extensive landscaping, street trees and street furniture. New parkway and vehicular traffic patterns were incorporated into the rebuilding program to improve traffic operations in Berkeley.

Linear parkways were developed in conjunction with BART aerial guideways along approximately 20% of the urban residential settings. In Albany and El Cerrito, a 2.7-mile parkway was built as an urban beautification demonstration project of the U. S. Department of Housing and Urban

Development.[1] The prime objective of the project was to demonstrate how the rights-of-way under aerial structure could be treated so that the structure would be more aesthetically acceptable to the communities in which it is located and offer a more attractive view to the commuter.

The right-of-way on which the parkway is situated averages approximately 40 feet in width with some portions narrowing to 25 feet. Alongside the entire BART right-of-way is the Santa Fe Railroad. The linear park consists of a continuous meandering walkway periodically developed for sitting areas, play lots and places of assembly.

The Albany portion of the linear park replaced a row of houses seven blocks long, which were removed to accommodate the aerial guideway and widen the adjacent street. The linear form of the guideway can easily be seen because of the openness of the linear park next to the street. The scale and height of the aerial guideway, as well as its strong linear form, contrast with adjacent residential development. However, landscaping in the linear park reduces this visual contrast by partially breaking up the massiveness of the guideway.

No houses were removed to accommodate the development of the El Cerrito portion of the linear parkway. The aerial guideway and landscaping were placed in a channel between adjoining buildings previously created by the railroad right-of-way. The linear park forms a new landscaped pedestrian area within the existing urban residential neighborhood.

In Berkeley, along Hearst Street and in the vicinity of the North Berkeley BART station, a strip of vacant land was created by the cut-and-cover subway construction. Residential structures and landscaping were removed during construction. This 1.3-mile corridor remains, many years after completion of BART construction activities, a visual detraction to the surrounding urban residential area.

Where has BART been responsible for the most significant effect on the visual environment?

Central downtown areas, regional shopping centers and industrial/commercial areas have generally been visually enhanced by BART. Major street improvements and plaza development have taken place in downtown San Francisco, Oakland, and Berkeley. BART has been located adjacent to three regional shopping centers (El Cerrito, Bayfair, and Fremont) and consequently brought additional attention or focus to these centers. In industrial/commercial areas, 11 miles of BART aerial structures and embanked guideway helped to visually clarify these areas and separate them from nearby residential land uses.

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[1] U. S. Department of Housing and Urban Development (1974), Linear Parkway, Washington, D. C.

Alignment with freeways, the use of subway configuration, and linear parks helped to make BART visually more compatible with adjacent development. The lack or concealment of parking lots, location near centers of activity and proximity to larger visual forms and generous use of landscaping (especially mature trees) have also helped make BART visually compatible with its surroundings.

Smaller downtown areas were often weakened by the peripheral location of visually prominent and active BART stations and parking lots. In residential areas, BART line and stations have had the most significant visual effect, primarily through introducing sharp contrast in scale and architectural character and by drawing attention to quiet and relatively inactive areas. These negative effects have been somewhat offset by linear parkways beneath a portion of BART's aerial structures.

In most instances, BART facilities have had little or no visual effect in areas of open land and water. Much of these areas are traversed by BART in either a tube beneath the Bay or in a tunnel through the Berkeley Hills.

A summary indicating degree of visual effect by local setting is provided in Table 2. From the table, it is apparent that the visual environments of urban residential and suburban residential areas are the most affected settings.

Table 2
EVALUATION FACTORS AND EFFECTS ON VISUAL SETTINGS

Evaluation Factors	Central Downtown	Sub-Centers	Urban Residential	Suburban Residential	Industrial Commercial	Open Land and Bay
Visual scale	O	◒	●	●	O	O
Architectural character	◒	◒	●	●	O	O
Visual focus	O	●	●	●	◒	◒
New open space	◒	◒	●	●	O	O
Refurbishment of existing spaces	●	◒	◒	◒	◒	O

● Significant effect on visual environment.

◒ Some effect on visual environment.

O No noticeable effect on visual environment.

ILLUMINATION

The operation of BART has resulted in increases in local levels of illumination which are primarily due to lighting installations around BART stations, parking facilities and maintenance yards. Increased nighttime operation of the BART system has also resulted in new light sources being introduced into the environment for extended periods of time. As the operating schedules of BART are extended, the effects of nighttime illumination will increase. The assessment of the effects of BART-related illumination on the surrounding nighttime visual environment was conducted to determine the degree to which these new light sources have affected the quality of the nighttime visual environment.

Methodology

Field observations were conducted at selected sites to assess the effects of BART lighting on surrounding developed areas. The observations were made at six sites during nighttime operational periods. Photographs were taken to document the observed effects on the visual quality of the environment (p. 40). It was assumed for the purposes of this study that urban and suburban residential areas were the most sensitive to changes in illumination levels. In addition, it was assumed that direct exposure to visible, unshielded light sources was disruptive to the nighttime visual environment. These assumptions will be tested in Phase II as part of the response survey.

Issues and Findings

How does the design and placement of lighting systems affect the adjacent environment?

The impacts of BART illumination on residential areas were judged to be directly related to the design and location of lighting systems used to illuminate stations, parking facilities and maintenance yards. Special luminaire designs, such as were used in the Glen Park station plaza, minimize the horizontal spread of light while providing adequate lighting for the plaza area. This type of luminaire tends to minimize the effects of BART lighting on adjacent areas by reducing the amount of excess illumination outside the station area.

In areas where efforts have been made to utilize luminaires which conceal light sources, the nighttime illumination of BART facilities has had less effect on adjacent residential areas. While shielding light sources may result in some slight reduction of effective light levels, adequate illumination levels can be maintained for safe and convenient operation of stations and parking facilities without excessive direct exposure of light sources to the surrounding community. In contrast, the high-intensity luminaires mounted on tall poles, used to provide general illumination of the BART maintenance

yards, resulted in maximum exposure of light sources to the adjacent developed areas. The overall illumination levels in the surrounding areas appear to have been increased significantly as a result of these installations.

What other factors determine the effects of BART lighting on the existing environment?

Adverse visual effects resulting from BART lighting were most apparent in residential areas adjacent to stations which have straight grid pattern streets and relatively flat topography. These conditions allowed for a maximum dispersion of light from BART facilities into surrounding developed residential areas. In locations where trees surround the parking facilities or where the topography is varied, the dispersion of light from stations and parking lots onto adjacent properties was reduced. Residential areas with relatively low levels of nighttime illumination, and which were adjacent to BART stations, experienced significant increases in the overall level of illumination as a result of BART lighting. The exposed light sources on stations and in parking facilities were also more visible in comparison to the surrounding lower illumination levels. This condition exists almost exclusively in residential areas.

SHADOWS

Shadows created by BART guideways and stations generally occur in those areas where the alignment is in an aerial configuration. These shadows provide either beneficial effects by creating shaded areas where there is no other shelter from the sun, or can result in negative effects by preventing sunlight from reaching areas where it is desired.

Methodology

The assessment of daytime shadow impacts resulting from BART facilities utilized observations made at specific sites representing systemwide shadow conditions. Aerial guideways, which account for 23.6 miles of the 71-mile system, and elevated stations, the prime causes of shadows, were identified and categorized according to their orientation to the sun, height, and surrounding land use. This information provided a preliminary indication of where the most significant impacts could be anticipated. Aerial photographs and BART track charts were used to determine the location of potential shadow effects and adjacent residential development. These sites were observed at different times of day and year, and shadow lengths were projected using sun angle calculations. Photographs were taken at these sites, showing shadow effects of structures and moving trains.

Issues and Findings

What are the most significant determinants of BART shadow impacts?

During the course of the shadow assessment, four factors were found to be responsible for creating the majority of shadow impacts along approximately 7% (5 miles) of the 71-mile BART system.

- The height of guideways and stations relative to the adjacent land and structure.
- The orientation of aerial guideways and stations relative to the position of the sun.
- The proximity of structures and open space areas to aerial BART facilities.
- The frequency of train operations.

Aerial guideways and stations are considered to be the primary source of shadow impacts on adjacent development. The alignment of aerial guideways in freeway and arterial medians, linear parks and in open areas generally resulted in shadows falling in these intervening open spaces rather than on nearby buildings. However, where shadow effects of BART do exist, they are considered to be similar to those created by trees, landscaping and other structures in that the shadow effect occurs for only a portion of the day and is dependent on the relative positions of the sun, transit structure and affected area.

I. DEFINITION AND SCOPE

The assessment of BART's impacts on visual quality examined three main areas: appearance, illumination and shadows. The study concentrated on BART's visual effects on its surroundings.

The methodology of the appearance study was separated into regional and local focuses. The regional study was a broad-brush, subjective analysis. The local assessment involved categorizing BART's surroundings into six visual setting types (e.g., central downtown, urban residential, suburban residential, industrial/commercial, etc.) and evaluating visible BART facilities within each setting. The process first assessed the degree of visual change caused by BART facilities, and then the visual effect of the BART-related visual changes. Methodologies for illumination and shadows were based on direct observations and analysis.

The report which follows is organized into four chapters: Study Strategy and Phasing, Findings, Implications, and Methodology.

II. STUDY STRATEGY AND PHASING

The focus of this Phase I effort was on an assessment of the visual impact of the BART system on the entire Bay Area (a regional perspective) and the visual interaction of BART facilities and their surroundings (a local perspective). This study identified key factors that influence the appearance of BART in its various configurations and settings and described the visual changes BART has made in the areas it passes through.

RESEARCH QUESTIONS

To help guide the Phase I portion of the study, a series of research questions were formulated. They are based on review of other visual assessments and observations of the BART system.

1. How does visibility of the system vary in different locations?

2. What are the dominant visual features of both BART and its surroundings that determine BART's local image?

3. How does BART's local image in specific locations compare with the image of those areas prior to BART?

4. Have visually dominant structures, land forms and natural areas been displaced by BART?

5. What kinds of major communitywide improvements have been made in conjunction with the construction of BART?

6. To what extent does BART have a consistent systemwide visual image?

PHASING

The Phase I study generally covered BART's direct impacts on appearance, and, for the most part, the indirect impacts of BART-induced development were not studied. Surface improvements to urban boulevards and certain other arterials, public plazas, linear parks and BART facilities themselves were considered direct visual impacts of BART for the Phase I assessment.

It is anticipated, however, that over a period of several years, private development induced by BART, and public improvements made in conjunction with BART, will result in significant visual impacts. Intensification of both residential and commercial land use has begun near some BART stations, and it is quite probable that this trend will continue. San Francisco has anticipated such intensification around most of its stations and has recognized it by modifying land use controls to encourage new station-related developments. Walnut Creek has one high-rise office tower, probably due to BART, adjacent to the station, and is considering building height and bulk controls that would encourage such height near the station. Therefore, one task of the Phase II effort will be to evaluate the visual impacts of BART-induced development.

The Phase I appearance study was a visual analysis looking at BART from outside of the system. In Phase II, the study of BART's impacts on appearance will be continued through a user analysis. This will attempt to assess the effects of the BART travel experience on the system's patrons. It will focus on the spaces inside the stations and on-board the trains.

The Phase I study of visual quality was based on findings and analysis carried out by design professionals, that is, professional experience was used to evaluate BART's effects on appearance. The Phase II study of the affected public's feelings and attitudes about BART-related changes in appearance will be sought, and these could produce several results. One would be to raise visual issues that were not identified by professionals in the Phase I study; another would be to compare the design professionals' concepts of aesthetics, urban design and visual quality with the concepts of affected laymen. Additionally, the Phase II study should produce detailed information on what visual impacts are felt and how people respond to these impacts.

III. FINDINGS

INTRODUCTION

The assessment of BART's impacts on appearance was separated into regional and local focuses. Findings resulting from the assessments of BART's illumination impacts and shadow impacts are included to complete the study of BART's effects on overall visual quality.

The regional visual environment was described in terms of very large-scale urban forms, such as hills, bay, ocean, urban centers and main transportation routes.

For the local assessment, the visual setting is presented according to visually characteristic setting types based on factors such as size, scale, density, land use, and degree of formality of development.

Findings are grouped into five sections: regional visual quality, local visual quality, illumination impacts, shadow impacts, and BART design awards.

REGIONAL VISUAL QUALITY

Regional Setting

The San Francisco Bay Area provides a unique visual setting of urban forms shaped by the ocean, the Bay, and hills. Urbanization has occurred within these constraints and has responded to them with major bridges, distinctive downtown areas, and relatively contained corridors of urban development.

The major Bay Area downtown areas have continued to grow physically and economically, rather than experience the decline felt by many other urban cores. This is due in part, perhaps, to the unique physical constraints imposed by Bay Area geography.

While considerable low-density peripheral growth has occurred in recent years, it has been concentrated around satellite core areas and in established development corridors, leaving substantial areas of natural vegetation and open space, as well as the Bay, between areas of development.

Within development corridors and in satellite growth areas, older activity centers have been de-emphasized by strip commercial development. Arterial streets, once the main routes between the Bay Area activity centers, are now

subservient to the freeways and are primarily local in focus rather than regional. Regional shopping centers have refocused commercial activity in new areas and added a new element to urban form.

BART's Effect on Regional Urbanization Characteristics

BART has generally enhanced regional urbanization characteristics by reinforcing existing development patterns and major transportation corridors, and by not visually affecting open and natural areas.

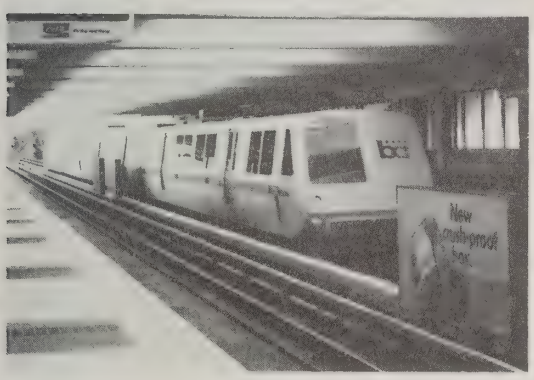
By virtue of location of main BART destination stations and plazas, and through refurnishing of urban boulevards, the major downtown areas have been visually emphasized. All eight downtown areas (San Francisco, Oakland, Berkeley, Concord, Richmond, Hayward, San Leandro and Walnut Creek) in the three BART counties are served with BART stations. Twelve additional local activity centers (Orinda, Lafayette, lower College Avenue commercial street, Glen Park, Mission Street commercial area, Union City, Daly City, Fruitvale commercial area, Alameda County Coliseum complex, Ashby-Adeline commercial area, Pleasant Hill, Oakland Museum-Laney College area) have BART stations located nearby. Three regional shopping centers (El Cerrito Plaza, Bayfair, and the Fremont CBD) have adjacent BART stations. Over 15 miles of freeways, the dominant existing regional transportation routes, have been visually strengthened by stations and lines in median and adjacent alignments.

The openness of the Bay and natural state of the Berkeley Hills, both important elements of Bay Area regional urban form, have been left visually untouched by the placement of BART in the Transbay Tube and tunnel configuration through the Berkeley Hills.

It was hypothesized that the general understanding of Bay Area geography has been increased for BART users through BART system maps and the location and naming of BART stations for nearby community activity centers and downtown areas. For example, riders to Concord probably have more feeling for where Union City is, and riders in Berkeley can probably more easily identify the general area where Pleasant Hill is, as a result of the existence and operation of the BART system. While this hypothesis was not validated in Phase I, surveys planned for Phase II may shed some light on whether or not BART contributes to an individual's perception or image of the Bay Area.

Regional Scale Visual Image

BART has a distinct visual image composed of different elements which occur throughout the 71 miles of the system. These include: the trains, elevated stations, aerial guideways, combined freeway and BART alignments, plaza areas and directional signs.



- The trains are highly visible and immediately identifiable as BART. They are visually unique as a transportation mode, uniform in appearance, are in motion and are seen in all above-grade areas of the system.

- Elevated stations are the most numerous station type (20 of 34) and most highly visible. They are generally visually distinct from one another throughout the system, yet are easily recognizable as part of the system. Underlying functional requirements, such as platform length, escalators and elevators for the handicapped, impart a strong uniformity to appearance, while variations in platform (side and center) and support type (aerial structure and embankment), as well as individual design approaches, help avoid monotony.

- Aerial structure, particularly when aligned with arterials, is a distinctive urban form and is the most visible type of BART line configuration.

- Freeway median/BART alignments are visually well known because of the high visibility of stations and moving trains in these busy transportation corridors.

- Plazas in downtown San Francisco and the decorative above-grade station entrance structure in Berkeley are highly visible indications of the system, even though the stations themselves are not directly visible in these locations.

- BART directional signs guiding motorists toward stations are distinctive and expand BART's visual image beyond immediate station areas and visible system facilities.

LOCAL VISUAL QUALITY

Local Visual Settings

For the assessment of local visual quality, sites were selected to represent the major combinations of local visual settings and variations in BART facilities. BART's local visual settings were divided into six types. The local findings are presented according to these types. Each of the six visual settings will be described with its respective set of findings.

TABLE 3
BART's SIX VISUAL SETTING TYPES
AND CONFIGURATIONS

	Guideway Configuration (In Miles)				
Visual Setting	Subway	Surface	Aerial	Total In Each Setting	Percent of Total
Central Downtown Areas	3.0	---	---	3	4
Small Downtown and Commercial Sub-center Areas	3.5	.5	1.0	5	7
Urban Residential Areas	5.3	4.7	8.0	18	25
Suburban Residential Areas	---	13.0	6.0	19	27
Industrial/Commercial Areas	.5	2.5	8.0	11	16
Areas of Open Land and Water	8.0	6.4	.6	15	21
Totals	20.3	27.1	23.6	71	100

A part of nearly every setting (with the exception of the central downtown areas) is BART aerial structures. They presented the system's designers perhaps the most difficult visual problem to deal with. For this reason, they are dealt with in a separate subsection later in this chapter.

Central Downtown Areas

Description of Visual Setting

The downtown sections of San Francisco, Oakland, and Berkeley comprise about 4% (3 miles) of BART's 71 miles and include seven of BART's 34 stations. The formality of street space and building design distinguishes them from other areas through which BART passes. Each of these areas is dominated by a broad, formal boulevard--Market Street in San Francisco, Broadway in Oakland, and Shattuck Avenue in Berkeley. The buildings along these boulevards create strong continuous facades, and many have large formal entrances. The density of buildings or the degree of land coverage in these areas is much higher than elsewhere in the region. The predominant land uses are office and retail commercial, which are generally intense and composed of multi-story office structures, some as high as 40 stories in San Francisco, and large-scale retail operations such as department stores and clusters of specialty shops. Pedestrian activity in each of the three centers is considerably more intense than in any other part of the region.

FIGURE 1
CENTRAL DOWNTOWN AREAS
ALONG BART

BART Characteristics in Central Downtown Areas

All BART line in central downtown areas is in subway. While less than 5% of BART mileage is located in such areas, over 20% of the stations with about 45% of BART's daily patronage are in these downtown areas. All seven stations (Civic Center, Powell Street, Montgomery Street, Embarcadero (not yet open), 12th and 19th Streets in Oakland, and Berkeley)

are in subway. Civic Center and Powell Street have adjoining plazas, while Berkeley has a small plaza and decorative above-grade structure marking the main entrance.

Refurbishment of Central Downtown Areas

BART has been instrumental in major visual changes in the downtown areas in which it is located. All three major downtown areas have been aesthetically enhanced by the refurbishing of urban boulevards, which occurred as part of cities' rebuilding of streets in areas of BART subway construction. The refurbishing has included the creation of pedestrian-oriented plazas in congested downtown areas. All the three miles of BART in downtown areas have been accompanied by such city-initiated and partially financed improvements.

Hallidie Plaza at the Powell Street station and the Market Street improvements add life and dignity to a most important intersection in San Francisco. With BART, and eventually Muni streetcars, in subway beneath Market Street, the street space will be preserved. It has been enhanced by new street trees, widened sidewalks with new paving, new reproductions of historic street-light fixtures and new street furniture, including benches and signs. The total cost of these improvements is approximately $34 million. Similar, though less extensive, improvements were made to Broadway in Oakland, and Shattuck Avenue in Berkeley.

PLATE 1
HALLIDIE PLAZA

Small Downtown and Commercial Sub-center Areas

Description of Visual Setting

Small downtown and commercial sub-center areas include residential along with office, retail, and commercial land uses. They include about five miles or 7% of BART's 71 miles. Nine stations are included in these areas or on their edges. The downtown portions of Richmond, Concord, Walnut Creek and Fremont, as well as the Mission District in San Francisco, the Lake Merritt/Laney College area in Oakland, and two shopping centers, Bayfair and El Cerrito Plaza, fall within this visual setting. These sub-center areas are characterized by less formality of the low-rise building facades, materials and street spaces than are central downtown areas. The dominant streets in these areas are less important in the urban structure than are the major urban boulevards. The land use and density of buildings in these areas are not as intense as those in major downtown areas. Retailing is the predominant land use, with office and residential uses intermixed. With the exception of Mission Street, there is less pedestrian activity in sub-center areas than in the central downtown areas.

FIGURE 2
SMALL DOWNTOWN AND
COMMERCIAL SUB-CENTER
AREAS ALONG BART

BART Characteristics in Small Downtown and Commercial Sub-center Areas

Most of the five miles of BART line in sub-center areas is subway line in San Francisco's Mission District and in Oakland, along 9th Street and under Laney College. The remainder is a mix of aerial and surface configurations in small downtown areas and at shopping centers. Nine stations are located in small downtown areas and commercial sub-centers, seven of them have parking lots.

Refocusing of Visual Attention

Three established small downtown areas (Walnut Creek, Concord, and Richmond) served by BART stations have been generally visually weakened by them, as have the urban sub-center areas of San Francisco's Mission District and the Oakland Museum-Laney College area near Lake Merritt station.

Large open parking lots, that tend to draw visual attention to centrally-located station structures, have been located on the periphery of the three downtown areas, thereby refocusing visual attention from the existing business districts and civic centers.

BART's peripheral location in Walnut Creek has created a new point of visual focus four to five blocks north of the existing downtown area. A similar situation has occurred in Richmond and Concord. While BART's location in these areas is perhaps necessary for operational and traffic reasons, it has, at the same time, had the effect of diluting visual focus from one point to several.

Newly Created Pedestrian Spaces

The plazas created in the sub-center areas of San Francisco provide needed pedestrian open space. In contrast to the visually and functionally well-integrated plazas created on Market Street, sub-center plazas do not lead to other activity places, so that pedestrian traffic is generally limited to BART patrons.

The plazas at the 16th Street and 24th Street stations on Mission Street (in San Francisco) are each divided into separate parts, on either side of Mission Street. The result is that visual focus is in the intersection instead of the plaza space. The lack of commercial frontage on these plazas makes them less visually active than adjoining Mission Street sidewalk areas. Together with the area around the Lake Merritt station, also lacking in visual focus in its open spaces, the Mission Street stations account for the urban sub-center areas along the BART system.

PLATE 2

PEDESTRIAN PLAZA
AT 24TH STREET AND
MISSION STREET

Compatibility in Scale

BART stations reflect the scale of adjacent shopping center complexes. Three regional shopping centers (El Cerrito Plaza, Bayfair, and the Fremont Central Business District) have a visually compatible neighbor in adjacent BART stations and parking lots. The large scale and dominant horizontal emphasis of the shopping center buildings and the openness of their parking lots are mirrored by BART's adjacent elevated stations and parking lots. Station structures provide definition for the previously visually weak spaces around these shopping complexes.

The strong horizontal lines of the El Cerrito Plaza station and aerial line complement similar forms in the adjacent shopping center. Visual focus has been extended from the store buildings to the BART station. Similar circumstances occur at the Bayfair Shopping Center and, to a lesser degree, at the Fremont Central Business District.

PLATE 3

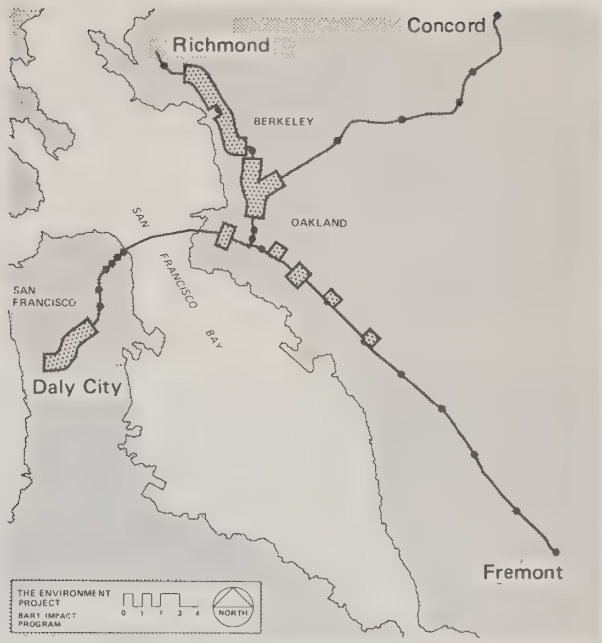
EL CERRITO PLAZA SHOPPING CENTER AND BART STATION

Urban Residential Areas

Description of Visual Setting

Considerable portions of BART's surroundings (about 18 miles or 25% of all BART line) are composed of medium-density, single- and multiple-family residential development with interspersed local service commercial facilities. These areas are characterized by closely spaced, detached and row houses that give a strong sense of uniformity to street scenes. Houses generally have no setbacks or very regular setbacks, particuarly in San Francisco and Oakland. Few lots are vacant, and lot coverage is usually much higher than in outlying suburban residential areas. The height of buildings rarely exceeds 40 feet. One- and two-story residential buildings are the norm. Commercial development is generally strip commercial, lining the several major arterials that run through these areas. There is little pedestrian activity in the urban residential areas.

FIGURE 3
URBAN RESIDENTIAL AREAS
ALONG BART



BART Characteristics in Urban Residential Areas

About half of the 18 BART miles in urban residential areas is on aerial structure, with the remainder divided between subway and surface configurations. About half of the nine BART stations in urban residential areas are subway stations, and seven of the nine have parking lots. Four BART stations are adjacent to both urban residential development and one of the other visual setting types.

Proximity to Activity Centers

BART stations are visually well fitted into urban residential settings when they are located near activity centers. These centers have been visually strengthened by the location of stations and parking lots near them and have, in turn, helped to visually assimilate BART facilities into residential surroundings. About half of the station structures have provided transition in scale from massive forms, such as freeways and shopping centers, to small-scale commercial and residential areas. Plazas, landscaping and parking lots have contributed to existing local open space and landscaping patterns at about one-quarter of urban residential stations.

At the Glen Park station, a subway station with no parking and an appropriately scaled, above-grade structure and plaza area blend well with local activity in the area while creating a transition in scale and materials from adjacent freeway structures to the local surroundings. Glen Park is an excellent example of the local visual compatibility of a BART station and its surrounding neighborhood.

However, about half of the BART stations and parking lots in urban residential areas are not located near activity centers and tend to create severe contrasts with adjoining residential development. In some instances, substantial numbers of residences in urban residential areas were removed for BART parking. The newly-created parking lots in these predominantly residential areas cause sharp contrasts between their openness and the closely-spaced adjacent houses. The open space created by the parking lot does not fit into the local pattern of development. This condition exists at the North Berkeley and Ashby stations.

PLATE 4

NORTH BERKELEY
BART STATION

Visually Mitigating Features

Joint use of freeway alignments, subway configuration and linear parks have helped to make BART lines visually more compatible within urban residential settings.

All of the surface line in urban residential areas (26% of the total 18 miles) has been located in the median of a freeway or alongside one. In all cases, these freeway segments were planned or built prior to BART so that BART had little new visual effect in the area. The mass, height and width of the freeway effectively mask BART's potential visual effects.

Approximately 10% of the 18 miles of BART line in urban residential areas runs in the median of an arterial on aerial structure. This combination, unlike the use of freeway medians, is visually troublesome because it focuses attention on the aerial structure, breaks up the existing street space, and makes for easy visual comparison of aerial structure with the adjacent smaller-scaled buildings. Street definition has been weakened by

the removal of buildings for street widening, which has left vacant patches of land at many points along the street.

PLATE 5

BART IN MEDIAN OF ARTERIAL - GROVE STREET

BART subway line (29% of the 18 miles) has generally left surrounding areas visually unaffected, but in some cases has resulted in the visual enhancement of streets through refurbishment. Only along Hearst Street, where construction left vacant land parcels (not maintained), has BART subway line had a disturbing visual effect in an urban residential area. Adeline Street and Shattuck Avenue, also in Berkeley, were refurbished with street trees and street furniture as well as a new parking and traffic layout.

BART aerial structure (45% of the 18 miles) has worked best in urban residential areas when it is associated with the creation of linear parks at its base, as was done along a portion of the guideway in the Albany-El Cerrito area and along a portion in Concord.

The major objective of the El Cerrito-Albany linear parkway, which was undertaken as a HUD urban beautification demonstration project, [1] was to show how the rights-of-way under an aerial structure, whether for rapid transit or other purposes, could be treated so that the structure would be more aesthetically acceptable to the communities.

The right-of-way for the aerial structure averages approximately 40 feet in width, with some portions narrowing to 25 feet. For the most part, the

[1] U.S. Department of Housing and Urban Development (1974), Linear Parkway, Washington, D.C.

right-of-way adjoins residential properties. Along the full extent of the right-of-way is the Santa Fe Railroad, which generally consists of a single track on its 40-foot right-of-way. The concept for the parkway was to treat the area under the concrete aerial structure as a continuous meandering walkway periodically developed for sitting areas, play lots, and places of assembly. Two types of linear park were created.

PLATE 6
ALBANY LINEAR PARKWAY

The Albany linear park replaced a row of houses seven blocks long which were removed to accommodate the aerial structure and widen the adjacent street. The strong linear form of the aerial structure can easily be seen because of the openness of the linear park next to the street. The scale and height of the aerial structure, as well as its strong linear form, contrast with adjacent residences. However, landscaping in the linear park helps to reduce this visual contrast by partially breaking up the visual continuity of the structure and the park space.

No houses were removed for the El Cerrito linear park. The aerial structure and landscaping were placed in a channel between adjoining buildings and land forms previously created by the railroad. No major piece of the aerial structure can be seen; thus, the strong linear form is rarely perceived.

Residual Vacant Land

BART lines have been visually disturbing where existing structures have been removed, leaving unsightly vacant land. Fortunately, only one area has been affected in this manner. In Berkeley, along Hearst Street and in the area north of the North Berkeley station, a vacant strip has been left by

cut-and-cover subway construction. This vacant land weakens the once-comfortable street space of tree-lined Hearst Street and creates unattractive vacancies in a closely spaced, urban residential neighborhood.

PLATE 7

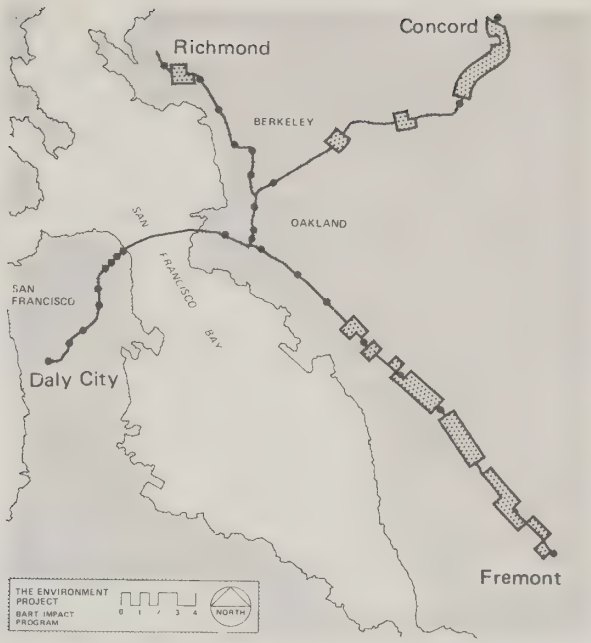
BART-CREATED
VACANT LAND ALONG
HEARST STREET

Suburban Residential Areas

Description of Visual Setting

In the outlying areas of Contra Costa and Alameda Counties, suburban residential areas make up approximately 19 miles or 27% of BART. These areas are less intense in development than the urban residential areas. Street space is informal, being primarily local residential streets. Detached single-family residences form the majority of these areas, and generally vary in design and placement of their lots on any given street. Large amounts of landscaping on streets and in private yards are often found. Land coverage is low (generally 3-5 units to the acre), while the height of structures rarely exceeds one story. Retail activities in the suburban residential areas are almost exclusively local service commercial and tend to take on the feeling of village centers rather than strip commercial. Pedestrian activity in these areas is virtually non-existent with the exception of children playing in streets and localized retail pedestrian traffic.

FIGURE 4
SUBURBAN RESIDENTIAL AREAS ALONG BART



BART Characteristics in Suburban Residential Areas

There are 19 miles of BART line in suburban residential areas. About two-thirds is surface trackway and one-third is on aerial structure. No line is in subway in these areas. There are six stations adjacent to suburban residential settings, and all have parking lots.

Variations in Configuration

Aerial line is about one-third of the 19 miles of BART in suburban residential areas. BART aerial structure in suburban areas is often set off visually by the open spaces of streets and railroad rights-of-way, which permit easy visual comparison of small-scale houses with the larger scale and strong linear form of the aerial structure. In many locations, the aerial structure is substantially higher than the predominantly one-story suburban development.

PLATE 8

BART ON AERIAL STRUCTURE IN SUBURBAN RESIDENTIAL AREA - PLEASANT HILL

In Union City, BART aerial structure clashes with the surrounding suburban scale. Extra height and atypical support structures needed to cross the Western Pacific railroad tracks intensify the visual conflicts with the setting, as does the lack of landscaping under the structure.

Over two-thirds of BART line in suburban residential areas is surface trackway. Adjacent railroads and low development densities required the removal of few houses for BART surface trackway. Along David Avenue, in Concord, substantial landscaping of surface and embanked line has visually enhanced a former railroad right-of-way. However, the majority of BART surface line has resulted in few visual changes in its suburban settings, which represent nearly 20% of BART's full 71 miles.

Visual Effect of Parking Lots

BART parking lots often have the greatest visual effect of any BART element in suburban residential settings, either because they are not located near activity centers, have removed residences and landscaping or have been accompanied by increases in freeway visual impacts.

Four of the six stations in suburban areas were not located near activity centers, although a small commercial center has been built near one of these (Union City) and the potential exists at most of the others. While the lack of nearby medium-scale structures makes stations and parking lots visually out of scale, the lower rate of land coverage in suburban areas results in fewer sharp visual contrasts than in the more densely built urban residential areas. In two of these four cases, no structures were removed for BART facilities and some vacant land continues to surround them.

The parking lot at Bayfair station is divided into two sections, functionally and visually. The section entirely adjacent to suburban residences required removing substantial numbers of existing homes that were visually compatible with the area. The parking lot's openness is visually out of place in this suburban setting. Scale contrasts between the station structure and nearby houses, and the weakening of local street space through the loss of residential street facade, have resulted. Three of the six stations adjacent to suburban residential development have similar visual effects.

The parking lot at the Orinda station was located between the eastbound and westbound lanes of the widened freeway. The resulting visual form of the freeway is very much out of scale with the adjoining small town center and has become the dominant visual element in this small valley. Major changes in the form of the hills were required to widen the freeway and swing it around the BART parking lot. Such changes are visually damaging, particularly in suburban settings. Fortunately, this condition is infrequent in the BART system. The Lafayette station also accompanied the widening of the freeway, but parking here was not located in the median.

Preservation of Visual Character Through Landscaping

The development of major landscaping in BART parking lots helps preserve much of the previous visual character of the site. At the Pleasant Hill station, which has one of the largest parking lots in the BART system (about 1,400 spaces), retention of a stand of mature oaks on the site, and the addition of substantial numbers of new smaller trees, helped to visually break up the lot into several small spaces and screen the station and aerial structure from view. The tall trees maintain a visual continuity with the many others in the area. Unfortunately, this condition is unique and not found at other locations.

PLATE 9

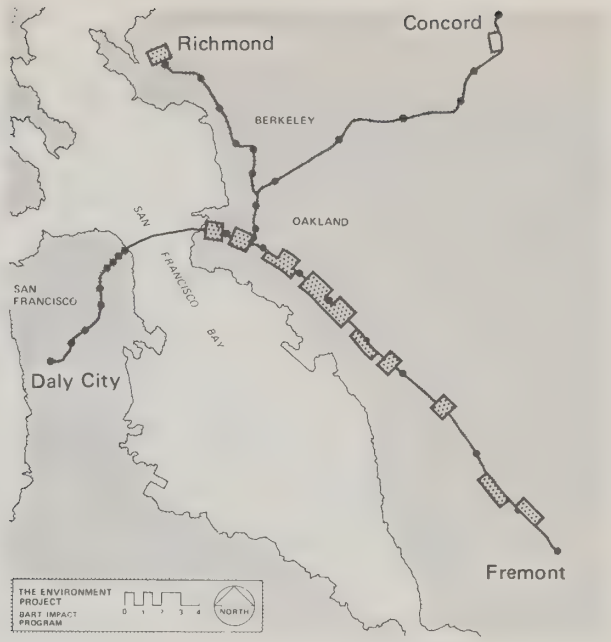
BART STATION IN PLEASANT HILL

Industrial and Commercial Areas

Description of Visual Setting

Large parts of the BART corridor through Oakland, Richmond, San Leandro, Hayward, Union City, and Concord are in predominantly commercial and industrial land uses. These areas make up about 15% or 11 miles of the 71-mile BART system and are characterized by a low degree of formality in the building placement and massing, which results in a highly varied street space. Buildings and related yard areas often cover a large percentage of the land area, and individual buildings tend to be very large in scale (warehouses, factories, and other large industrial facilities). The height of the structures is generally 40 to 50 feet with occasionally higher structures. The predominant land uses are industrial production and various sorts of related commercial activities such as warehousing and trucking operations. Heavy railroading activity is associated with nearly all of these areas. Pedestrian activity is virtually non-existent.

FIGURE 5
INDUSTRIAL AND COMMERCIAL AREAS ALONG BART



BART Characteristics in Industrial and Commercial Areas

Nearly three-quarters of the 11 miles of BART line in industrial/commercial areas is on aerial structure, with almost all of the remainder on surface trackway. Only one station is in an entirely industrial commercial area, while four others adjoin such areas on one side.

Complementary Architectural Character

About one-third of all BART aerial structure is located in industrial/commercial visual settings. BART stations are generally visually compatible in industrial/commercial areas and, in two cases (Union City and Coliseum stations), help the transition from the very large forms of the adjacent industrial and coliseum structures to adjoining residential development. The Union City station is located between a heavy industrial facility and a new suburban commercial and residential area. The station and embanked trackway provide transitions in scale and size, as well as some visual screening between the areas.

Arterial street space in industrial/commercial areas is often given strong definition by the aerial structure of BART running alongside or in a median of the street. In many cases, street facades in these areas were not cohesive and were visually confusing, generally providing poor street definition. The aerial structure has often effectively screened such chaotic views and improved street definition. The BART aerial structure along San Leandro Avenue, south of the Coliseum station, is a good example of new, strong street definition BART has provided in an industrial/commercial area, while screening visually confusing views from motorists.

PLATE 10

BART AERIAL STRUCTURE ALONG SAN LEANDRO AVENUE

BART line on embankment, which comprises nearly 25% of industrial/commercial BART mileage, has enhanced parts of Concord, Hayward, and Union City by partially visually screening industrial areas from nearby residential areas.

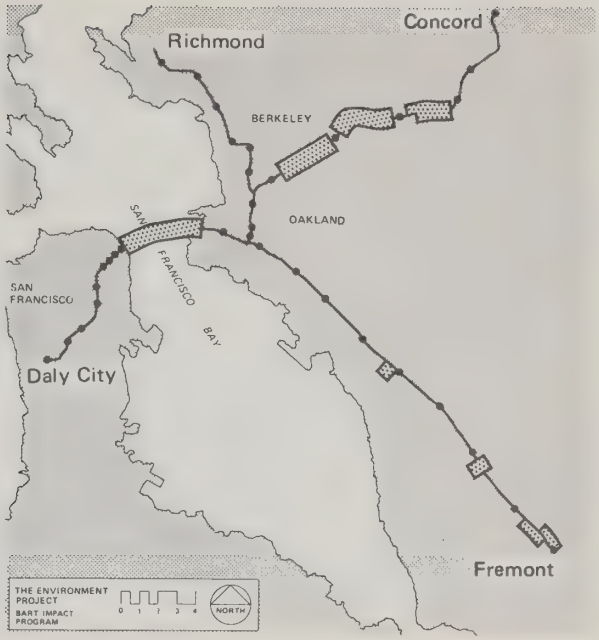
All three BART maintenance yards are adjacent to industrial areas where the visual impact of their large buildings, large open yards and long rows of trains is similar to that of the industrial development.

Areas of Open Land and Water

Description of Visual Setting

Bay and undeveloped hills, sparsely developed residential areas, and commercial open space comprise over 20% of the BART corridors. These areas are characterized by openness, generally natural vegetation and few structures. There are few streets and the structures that exist in these areas tend to be widely spaced, single-family residences that rarely exceed one story in height. Land uses are essentially very low-density, single-family residential, commercial recreation (Hayward Golf Course) and quarrying operations (Fremont). Even where commercial activities dominate, open space is the predominant feeling one has about these areas. Pedestrian activity is generally non-existent.

FIGURE 6
AREAS OF OPEN LAND AND
WATER ALONG BART



BART Characteristics in Open Land and Water

Over half of the 15 miles of BART lines in areas of open land and water are in the Transbay Tube or the Berkeley Hills Tunnel. Nearly all of the remaining half is in the median of Highway 24 between Orinda and Walnut Creek. There are no stations in areas of open land and water.

Avoidance of Visual Impact

BART has had virtually no visual impact on the two major natural areas which its alignment traverses--San Francisco Bay and the Berkeley Hills. BART is in a tube as it crosses under the Bay and in a tunnel as it traverses the Berkeley Hills.

However, BART has had some effect in the hilly areas around Orinda (located just east of the Berkeley Hills). Here, BART is in the median of Highway 24, an existing freeway which was widened and partially realigned in conjunction with BART's construction. After the widening, the freeway became a stronger visual element in contrast to the surrounding natural forms of hills and valleys. BART itself has little visual impact as it is dominated by the freeway facility. But, the change to the freeway and its visual impact would not have occurred if BART had not been built.

PLATE 11

BART AND HIGHWAY 24
AT ORINDA

Aerial Structure Design

The aerial structure presented probably the most challenging problem for BART designers because of its height and its frequent location adjacent to or in the median of arterials. It is the most visible of BART's three line configurations. About 60% of the aerial structure is in residential areas, often in close juxtaposition with small-scale houses and local residential streets.

PLATE 12

BART AERIAL
STRUCTURE

Response to Design Challenge

The designers responded to the design challenge in three primary ways. One, the support elements were chosen to give horizontal scale to the structure. Their spacing and clear architectural expression, through decorative projections beyond the guideway, give the powerful horizontal form of the guideway a rhythm similar to that of building facades, street trees and street lights. Two, in order to reduce the appearance of massiveness of the individual support elements or bents, careful articulation of their surfaces was required. Faceting of the columns and the gentle upward slope of the "T" arms receive light, both day and night, in such a way as to minimize their massiveness. Three, the guideway had a great potential for visually overpowering most other form elements, particularly in residential areas. By separating it into two parts, minimizing its cross-sectional bulk, and articulating it into several angled surfaces, the guideway elements have a visually interesting appearance and are less overpowering.

Minimizing Visual Conflicts of Aerial Structures

Elements that seem to be important in minimizing visual conflicts with residential settings are: height of the structure, characteristics of the viewing space, and the amount of landscaping provided with the aerial structure.

In general, the structure should not be significantly higher than nearby buildings, or its horizontal uniformity is emphasized and it tends to visually dominate nearby buildings, which present a much less consistent facade. Also when the aerial structure is higher than buildings or foliage behind it, sky can be seen beneath the guideway elements, which emphasizes the strong horizontality of the structure.

The viewing space existing around the aerial structure determines a great deal about how it will appear. Parallel street space or the equivalent allows long uninterrupted views of aerial structure. Its easily perceived linearity, extending for several blocks, becomes visually dominant. When little open space exists near the structure, it can only be seen in small pieces and is more easily brought into scale with nearby buildings.

Landscaping is the single most helpful design element in making aerial structure compatible with small-scale visual settings. Trees that are near the height of the structure can screen it from view or visually break it up into several shorter pieces. Vertical development of landscaping under the structure can turn it into a solid visual screen where desired without increasing its apparent massiveness. A grassy arterial median can fit aerial structure into arterial street space attractively, if it is as wide or wider than the guideway. It provides a visual base for the structure and prevents the guideway from dominating the street by hanging over it. Linear parks have been created

along nearly four miles of aerial structure. These parks have been well received by the public and have received urban design awards.

ILLUMINATION IMPACTS

BART has resulted in increases in local nighttime illumination which are primarily due to BART stations, parking lots and maintenance yards. Night operation of BART trains has also resulted in new light sources in the night environment.

Degree of Exposure

The degree of exposure of light sources is a major factor in the visual prominence of BART lighting. In the few cases, especially in residential settings, where efforts have been made to conceal light sources, the nighttime appearance of the BART facilities has enhanced adjacent areas. While shielding light sources might result in some additional cut-off and loss of effective light level, the present energy crisis practice of turning off a large percentage of parking lot lights has shown that substantially lower light levels are workable.

Aspects of lighting that increase visibility are unusually high light standards (BART yards), and low level installations along walkways and around stations, and on freeway supports (in the Rockridge parking area). Special lighting fixture designs, such as used in the plaza at Glen Park station, minimize the horizontal spread of light while adequately lighting the plaza surface.

PLATE 13

BART LIGHTING -
GLEN PARK

CONCORD MAINTENANCE
YARDS

Straight grid pattern streets, on flat terrain with little street tree plantings, are the conditions that maximize the spread of BART lighting effects. Dense trees in the area surrounding parking lots are effective in limiting BART lighting effects. Rising terrain, when sources are shielded, is also effective in minimizing the distance lighting is seen.

BART Train Lights

BART train lights do not appear to cause problems by shining into houses or yards.

No abrupt curves, which might cause train lights to shine on nearby residences, are found along the BART system. Further study in Phase II will investigate effects of train lights from the perspective of residents.

Ironically, BART trains may have more negative lighting effects in the daytime than they do at night. Reflections of the sun off train windows fall on houses and other buildings as trains move along above-grade trackway, particularly where BART is on aerial structure. These effects were observed in the Phase I study and will be further studied in Phase II. Generally, the location of such effects is similar to the location of shadow effects of BART trains, but reflections occur on the opposite side of the right-of-way.

SHADOW IMPACTS

BART Elements Associated With Shadowing

Aerial structures and passing trains cause practically all shadows that fall beyond BART right-of-way. Four factors are responsible for the shadow impacts along about 7% of BART's 71 miles: height of BART trackway above surrounding land and structures, orientation of the trackway to the position of the sun, proximity of houses and yards to BART trackway, and passing trains.

Alignment of BART above-grade trackway in freeway and arterial medians, linear parks, and in open areas results in shadows of aerial structure and trains falling in these intervening spaces instead of falling on nearby buildings. The intention in routing and designing aerial guideways was to minimize silhouettes. Design standards dictated that elevated structures should only be placed in streets or areas with a width of 100 feet between building lines. This was to provide separation of the guideway structure from adjacent buildings and result in light, shadow-free thoroughfares.

PLATE 14

BART SHADOW EFFECTS -
GROVE AVENUE

HAYWARD

Train Shadows

BART trains cast moving shadows on nearby residences along many parts of BART's aerial line. The shadows of moving BART trains possibly have the greatest effect among BART's shadows. They are a totally new source of shadows in residential areas, being unlike the shadow effects of freeways, conventional railroad trains or stationary objects, such as trees, buildings or BART aerial structure.

DESIGN AWARDS

In general, the BART system has been well designed; its many awards attest to that. However, it is one thing to have a well designed facility, given the many conflicting demands placed upon its design, and another to be able to be visually compatible with existing adjacent environments.

BART has received the following awards for various stations, guideway structure and overall system design.

May 1967 - Precast Concrete Institute
Grand Award for the Aerial Structure

March 1968 - HUD Urban Design Award
- Comprehensive Design Award
- Civic Center Station
- El Cerrito Del Norte Station
- El Cerrito and Albany Linear Parks
- Ashby Place Station (award design was not built)[1]
- The Aerial Structure
- The Transit Vehicles

October 1969 - AIA National Citation for Excellence in Community Architecture
- 12th Street, Oakland Station
- 19th Street, Oakland Station
- Coliseum Station

1973 - AIA National Collaborative Achievement Award in Architecture (for at least three of the following areas)
- Engineering
- Murals
- Sculpture
- Landscaping
- Craftsmanship

1974 - AIA Bay Area Chapters Honor Awards (given every five years)
- Orinda Station
- Hayward Station
- The Aerial Structure

[1] A consequence of the decision to put all of the Berkeley alignment, including stations, underground. See p. 139, A History of the Key Decisions in the Development of Bay Area Rapid Transit. 1975, MTC Report No. FR 3-14-75; available through National Technical Information Service.

IV. IMPLICATIONS

The findings just presented lead to a number of implications for transit development. A delicate balance must be achieved between the strong visual statements a transit system can make as a regional urban form and the local requirements, particularly of residential areas, to maintain a balance between the transit system and its visual settings of scale, size and intensity of visual characteristics.

MAJOR DESIGN VARIABLES

Location

The location of a transit system is a key factor in accomplishing the above goals. Obviously, by locating in subways and tunnels, most visual impacts are avoided altogether. However, the cost of subway construction makes extensive use of it impractical. Locating in the median of a freeway has many positive aspects resulting from the avoidance of visual confrontation with adjoining residential and commercial areas and a strengthening of urban form by giving added significance to an already important transportation corridor. However, this very strengthening of a transportation corridor can have visual impacts of its own that are essentially negative. Added width of a freeway corridor can result in the loss of structures and natural areas, as well as intensification of visual intrusion into remaining adjacent areas.

Aerial Structure

Aerial structures located in the median of arterials or alongside them can add strength and definition to the urban fabric as well as visually clarify the street space of such arterials. However, depending on adjacent land uses, the aerial structures can create adverse visual effects. This is particularly true in residential areas where they can visually dominate the surrounding smaller-scale structures.

Parking Lots

Parking lots for transit facilities are perhaps the single most important visual element of the system. Their size, shape, boundary conditions, lighting and the surrounding visual character are all important aspects that determine their visual impact. Their visual prominence is lessened by reducing their apparent size and minimizing lighting impacts. Screens and clumps of planting, large trees and irregularly shaped boundaries visually break large parking lots into several small areas. When street frontage is minimized, so is the apparent size of parking lots. When light sources are shielded, lighting is unobtrusive.

Stations

Stations, particularly elevated stations, are another major visual aspect of a transit system. In the Bay Area visual environment, it was not necessary to make BART stations identical nor for them to have major consistent design elements in order to identify stations with the transit system. The size, form and visual association with the transit line itself were enough to clearly identify above-grade stations as part of the rapid transit system. Additionally, the variations possible to the designer of each station resulted in distinctive and unique designs which often reflect the character and visual qualities of their surroundings without losing their identity as transit facilities.

Public Improvements

Major public improvements associated primarily with subway configuration are made possible through the replacement of street surfaces disrupted during construction. Public plazas in downtown areas can be provided to facilitate pedestrian movement and focus attention on important urban activity centers as well as subway transit stations.

Landscaping

Landscaping is undoubtedly the most significant factor in blending transit facilities into their surroundings and softening their appearance. Where possible, mature landscaping should be retained on sites being cleared for transit facilities, particularly parking lots. When this is not possible, new large-scale landscaping should be installed. Landscaping performs a multitude of visual functions. It can act as a visual screen, it can define areas, and it can serve to blend man-made land forms and structures into their surroundings.

Maintenance

The transit operation most important to visual quality is maintenance of landscaping, structures and the exterior of transit vehicles. Proper maintenance is critical to the continued visual benefits of landscaping. Removal of trash, graffiti and repair of broken or vandalized building elements is also crucial to maintaining the positive visual quality of BART facilities. Maintenance of the exterior of transit vehicles is particularly important in a system such as BART where the appearance of the transit vehicle is a major positive visual focus.

V. METHODOLOGY

Methodologies for assessing BART's visual quality varied, depending on the particular visual aspect under study. Different approaches were applied to the regional assessment, the local assessment, and the illumination and shadow assessment.

REGIONAL VISUAL QUALITY

The regional findings are primarily the result of extensive familiarity with the interaction between the BART system and major form-giving elements in the Bay Area. While there was no formal pre-established research methodology, the subject area was always a factor in seeking out BART's environmental impacts. The findings, which are subjective judgments made by professional urban designers, are based on observations made from aerial reconnaissance and photography, ground reconnaissance from areas surrounding the system, and from reconnaissance on-board the trains and in the station areas. The impressions gained from these various perspectives merged into concepts or findings relative to visual relationships between BART and the region.

It should be noted that analysis of "urban form" can be very broad and elusive. For our purposes, the study concentrated on just two aspects: patterns of urbanization and visual image. The former is obviously more than just a visual phenomenon, as it encompasses physical, social, economic and political components. However, the visual aspects of urbanization patterns or urban form play an important role in its conceptualization and, therefore, should not be overlooked. BART's regional visual image is an effect of the system's repetitive and highly visible surface and aerial guideways, stations and informational and directional signs. Taken together, they create a distinct new visual element and hence were included in the study.

LOCAL VISUAL QUALITY

Review of Existing Source Material

The development of a methodology for the assessment of BART's effects on visual quality started with a review of existing methods, guidelines and critiques. Three major sources were consulted:

- HUD's Interim Guidance Manual for Environmental Assessment

  Alan M. Voorhees & Associates (1974), Interim Guidance Manual for Environmental Assessment for Use by HUD Field Office Personnel, prepared for U.S. Department of Housing and Urban Development, Washington, D.C.

- EPA's Aesthetics in Environmental Planning

  Stanford Research Institute (1973), Aesthetics in Environmental Planning, prepared for U.S. Environmental Protection Agency, Washington, D.C. (Document No. EPA 600/5-73-009).

- Pre-BART Visual Analysis

  BART Residential Impact Study, Area Visual Survey; Edges Visual Survey; Landmark Visual Survey; Open Space Visual Survey

The material from these sources provided a check list in the development of a methodology specific to BART. This check list, as adapted for BART, included the following points:

1. The assessment process should be applicable to the broadest possible range of visual elements both of BART and its surroundings and cover both natural visual elements and man-made visual elements, which should include structures of all types, open spaces, street spaces and landscaping.

2. Direct visual effects of BART should be considered as well as indirect effects (BART-induced development to be studied in Phase II).

3. Visual changes should be assessed against an established baseline (the regional or local setting without BART being present, as determined from pre-BART photographs) of visual quality so that the magnitude of various visual changes can be compared.

4. The assessment method should be as simple and practical as possible, taking into account the size of the project to be evaluated. The results of the assessment should be easily understood and useful as a communication tool between planners and decision-makers and ultimately between decision-makers and the public.

5. The premises upon which the inevitably subjective judgments are based should be clearly stated to allow for a full understanding of the results.

Evaluation Steps

In assessing BART-related changes in appearance, a situation unlike most environmental assessments was encountered, that of assessing a built project. The assessment was charged not with forecasting BART's visual effects, but evaluating what was already there. A common baseline for the assessment of all BART-related visual changes was established. This consisted of BART's various visual settings prior to BART construction and was simulated for this assessment by graphically removing BART facilities from photographs and reconstructing visual conditions prior to BART.

The actual evaluation followed a two-step assessment process. The first step involved a recording of what visual changes were brought about by the placement of BART into a particular setting (land use setting). From photographs taken prior (1965) to the introduction of BART, it was possible to recreate a "no-BART" baseline. BART's effects of adding new structures (stations, guideways) and its effects on displacing facilities (houses, roads, landscaping, etc.) were collectively recorded.

The second step in the assessment process was determining the consequences of the BART-related change. A subjective and qualitative set of criteria was needed to point out the contributions of BART-related visual changes to the local settings. The underlying premise of these visual criteria was:

> BART facilities and related visual changes should complement and enhance without visually dominating their surroundings.

This basic premise was made more operational by the following criteria, developed to evaluate each study site for visual consequences on the local setting. They are largely based on professional urban design experience and the principles and policies of the San Francisco Urban Design Plan.[1] The criteria are BART-specific, taking into account BART's physical facilities and the physical environment in which BART is located. These criteria cluster around four issues: scale, focus, mitigation, and creation of new urban spaces.

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[1] San Francisco Department of City Planning (1971), The Comprehensive Plan: Urban Design, San Francisco, California.

Changes in scale:

- BART structures and open spaces (parking lots) that are larger in size and scale than those in the surrounding areas are likely to be visually in conflict with those areas, unless they provide a visual transition from even larger forms.

- Increasing the physical size and visual impact of one transportation facility in order to accommodate another transportation facility within its rights-of-way is visually offsetting and not necessarily complementary.

- Removal of structures of similar scale and density as their surroundings should be avoided.

Changes in focus:

- Increasing the visual focus of activity centers is usually desirable; and, conversely, the creation of visual focus on non-active areas, such as backyards of residences, is to be avoided.

- Vacant and unmaintained land resulting from construction activities can become undesirable points of visual focus.

Visually mitigating measures:

- Well-maintained landscaping can greatly assist in melding BART and the adjacent physical setting. The preservation of compatible landscaping is highly desirable.

Creation of new urban spaces:

- The preservation and enhancement of street and pedestrian spaces is desirable.

- When street or pedestrian spaces are preserved or when new ones are created, they should be visually connected to other similar spaces and should have clear visual focus.

Selection of Study Sites

The assessment of BART's effects on appearance required a broad range of sites to study the many complex factors that make up BART's appearance. Before actual study site selection, the area surrounding the entire BART system was examined, both in the field and from a systemwide series of photographs. Based on observation of land use; degree of formality of buildings and open spaces; and density, size and scale of structures, all areas along BART's 71 miles were categorized into local visual settings. Six settings were identified:

• Small downtown areas	3 miles
• Small downtown and commercial subcenter areas	5 miles
• Urban residential areas	18 miles
• Suburban residential areas	19 miles
• Industrial and commercial areas	11 miles
• Areas of open land and water	15 miles
	71 miles

These six categories are believed to represent, in general terms, all of the local land use settings adjacent to BART. They are, in fact, quite universal and represent the range of settings found adjacent to most transit systems.

Because it was physically impossible to evaluate all 71 miles of the guideway and 34 stations, a site selection process was necessary. Two main factors guided the selection:

- Visual variation of the setting
- Visual variation of BART facilities

Several sites were selected in each setting type. Each site represented a particular combination of setting and BART facilities. For example, within suburban residential areas, BART line runs both on the surface and on aerial structure. Six sites along surface embanked line were selected, and three along aerial were chosen. The sites proportionately represent the miles of each configuration of BART line in suburban areas, 13 miles on surface and 6 on aerial structure, but also exemplify the major

variations of condition within the suburban setting type. Three of the surface sites have parallel streets on one or both sides, while three have houses backing up directly to the line. Two of the three with parallel streets also have adjacent railroads, whereas the third does not. Of the two with adjacent railroads, one has BART closest to nearby houses, and the other has the railroad and a wide strip of open land between.

By this process, the major variations in BART appearance systemwide were represented in the final selection of 45 study sites (Table 4). Basic site selection factors were station and line configuration and adjacent activities, transportation and open-space facilities. At each site, BART-induced changes were recorded, and then the visual consequences of those changes were evaluated based on the previously described criteria.

Transferability of Methodology

The approach devised for this study of local visual quality is easily adaptable in hypothetical (unbuilt) transit alternatives analysis and evaluations elsewhere. In particular, the evaluation of a transit system's visual impacts according to a standard set of criteria within each of a set of physical setting types is both systematic and readily understood. Use of this approach elsewhere would help to standardize and clarify the evaluation of visual impacts, which at present tends to be done in many different ways for studies dealing with similar issues.

The six setting types used in this study are not unique to the Bay Area, and appear to be comprehensive enough for use elsewhere. The evaluation criteria were adapted form the San Francisco Urban Design Plan and also appear to be applicable elsewhere. However, in instances in which different criteria are prefered, such changes can easily be made. A major advantage of this approach, in fact, is its open display of evaluation criteria. This allows informed debate and acceptance or modification of these base premises based on the local community's aesthetic values and objectives.

Table 4
APPEARANCE STUDY SITES AND SELECTION FACTORS

		STATION	PARKING LOT	LINE	YARD	MORE THAN 1 SETTING	AERIAL	SURFACE	EMBANKMENT	SUBWAY	FREEWAY	ARTERIAL URBAN BLVD.	MEDIAN ALIGN.	RAILROAD	LOCAL STREET	BACKYARDS	OPEN LAND AND WATER	ACTIVITY CENTER	PLAZA	RELATED STREET IMPROV.	STRUCTURES REMOVED	VACANT LAND	BART LANDSCAPING MAJOR
Central Downtown Areas (4)	Powell St.	•								•		•	•					•	•	•	•		
	Berkeley	•								•		•	•					•	•	•			
	19th St.	•								•		•	•					•		•			
	Market St.			•						•		•	•					•		•			
		3		1						4		4	4					4	2	4	1		
Small Downtown and Commercial Subcenter Areas (4)	Walnut Creek	•	•				•				•	•						•			•		
	El Cerrito Plaza	•	•			•	•					•		•	•			•	•		•		
	Mission/16th	•								•		•	•					•	•	•	•		
	Lake Merritt	•	•							•		•						•	•		•		
		4	3	0		1	2			2	1	4	1	1	1			3	3	1	4		
Urban Residential Areas (14)	EC Linear Park			•			•									•			•				•
	Albany Linear Park			•			•									•			•		•		•
	Hearst St.			•						•		•				•						•	
	Shattuck Ave.			•						•			•					•		•			
	Grove St.			•			•				•	•	•							•	•		
	Grove-Shafter Fwy.			•				•			•		•										
	Alemany Blvd.			•			•				•	•											
	I-280			•				•								•	•		•					
	EC Plaza Station	•	•			•	•					•		•	•			•	•		•		•
	No. Berkeley	•	•							•		•			•						•		
	Ashby	•	•							•		•	•		•	•		•		•	•		
	Rockridge	•	•				•				•	•	•					•					
	Fruitvale	•	•				•					•		•						•	•		•
	Glen Park	•	•							•	•	•						•	•		•	•	•
		6	5	8		1	7	2		5	5	9	5	2	3	5	1	5	5	4	7	3	5
Suburban Residential (13)	David Ave.			•				•	•			•								•			•
	Ashland Ave.			•					•						•						•	•	
	Western Ave.			•			•								•								
	Whitman Ave.			•				•				•											
	Union City			•			•								•						•	•	
	Rancho Arroyo			•		•		•								•	•						
	Fremont			•		•			•							•	•						•
	Richmond			•					•							•							
	Pleasant Hill			•			•								•					•			•
	Pleasant Hill Sta.	•	•				•					•		•		•					•		•
	Lafayette	•	•				•	•			•		•					•		•	•	•	•
	Orinda	•	•					•			•	•	•										
	Bayfair	•	•			•	•		•					•	•	•					•		
		4	4	9		3	5	5	5		2	4	2	2	5	5	2	1		3	5	3	5
Industrial/ Commercial Areas (6)	Union City Sta.	•	•			•	•		•					•				•				•	
	San Leandro Ave.			•			•					•		•									•
	Coliseum	•	•			•	•					•		•				•			•		•
	Hayward Station	•	•				•		•			•		•	•						•	•	
	E. 12th Street			•			•					•	•							•	•	•	•
	Concord Yard				•	•		•							•		•						
		3	3	2	1	3	5	1	2			4	1	4	2		1	2		1	3	3	3
Areas of Open Land and Water (4)	Hayward Golf Course			•					•					•			•						•
	Highway 24			•				•			•		•							•			
	S. F. Bay			•						•							•						
	Berkeley Hills			•						•							•						
				4				1	1	2	1		1	1			3			1			1

ILLUMINATION

The assessment of BART illumination impacts was direct and simple. No instrument measurements were made. The assessment was based on the premise that directly visible light sources are generally disruptive to nighttime visual environments, particularly in residential areas.

Several sites were selected to assess the effects of concealing and exposing light sources. Field observations were made at: North Berkeley, Ashby, Rockridge, Orinda, Glen Park, and the Concord Maintenance Yard. Photographs were taken to document the observations.

The following research questions guided the illumination assessment.

1. Which lighting configurations result in the greatest exposure of light sources to viewers? Which result in the least exposure?

2. What are the local factors that govern exposure to BART lighting?

3. In what areas might the effects of BART train lights be most felt? What combinations of BART track configuration and surrounding development might result in such an impact?

4. Where has BART resulted in changes in local lighting?

SHADOWS

Daytime shadows resulting from BART facilities were studied at specific sites representing systemwide shadow conditions. Aerial structure and elevated station, the prime causes of shadows, were located and categorized according to their orientation to the sun, height, and surrounding land use. Aerial photographs and BART track charts were used to determine the location of potential shadow effects and adjacent residential development. Local vegetation was taken into account as a prior shadow source.

Representative sites were selected based on these categorizations. These sites were observed at different times of day and year, and shadow lengths were projected using sun angle calculations. Photographs were taken at these sites showing shadow effects of structures and moving trains.

ENVIRONMENT PROJECT PHASE I DOCUMENTATION

- Interpretive Summary*
- Environmental Impacts of BART* Interim Service Findings (1976)
- Acoustic Impacts of BART* Interim Service Findings (1976)
- Impacts of BART on Air Quality* Interim Service Findings (1976)
- Impacts of BART on the Natural Environment* Interim Service Findings (1976)
- Impacts of BART on the Social Environment* Interim Service Findings (1976)
- Impacts of BART on Visual Quality* Interim Service Findings (1976)
- Theory Background for Study of BART's Impacts (1976)
- Pre-BART Data Analysis (1975)
- Community Monitoring (1976)
- BART and Its Environment: Descriptive Data (1976)
- Research Plan* (1975)

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Metropolitan Transportation Commission

Sponsoring Organization

United States Department of Transportation
United States Department of Housing and Urban Development

*** Document is available to the public through the National Technical Information Service (NTIS), Springfield, Virginia 22151. Other documents are MTC internal working papers.**